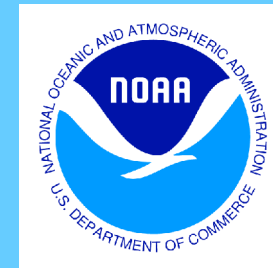
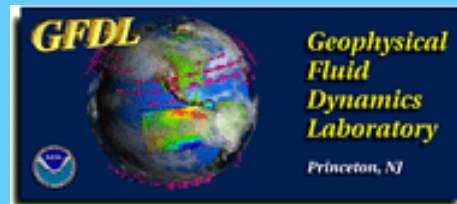


Intraseasonal Variability in the GFDL CM2 GCMs

Bill Stern

GFDL/NOAA

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GFDL Coupled Model Development Team
(CMDT)

Outline

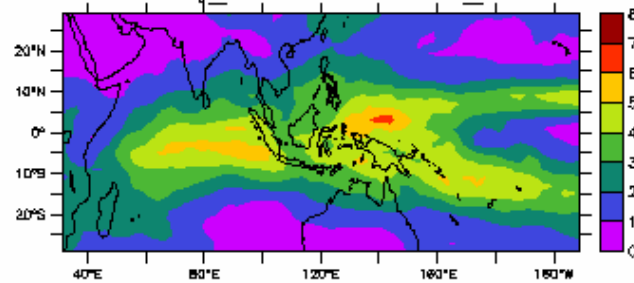
- Impact of MJO on Climate Variability
- Data and Analysis Approach
- Metrics for Assessing MJO Behavior and Structure
 - Geographic Distribution of ISO Activity
 - Seasonality
 - Wave-Frequency Spectra
 - Propagation
- Summary

Data and Analysis Approach

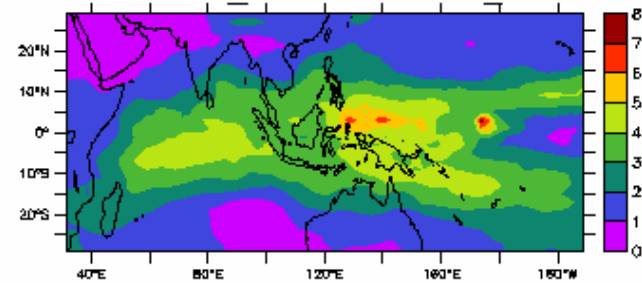
- Coupled CM2 Predictions Year 61 -> Year 100
- Atmos AM2p12b_AMIP2 1979 -> 1995
- GCPC (CMAP) Precip 1979 -> 1998
- NCEP Reanalysis zonal wind 1979 -> 1995
- 30-90 Day Bandpass filtering
- Extended EOF analysis is performed and PC extrema are used to select events for MJO composite life cycle.

Stdev precip_anom (30-90 day, NOV-APR)

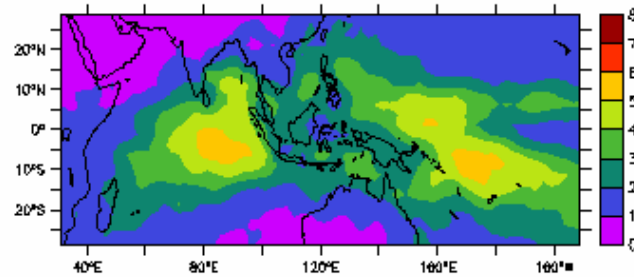
CM2Q_Control-1990_e1



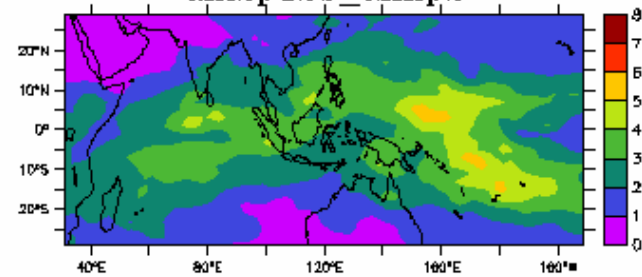
CM2.1U_Control-1990_c2



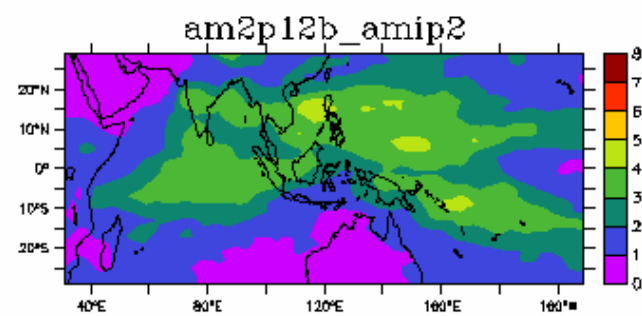
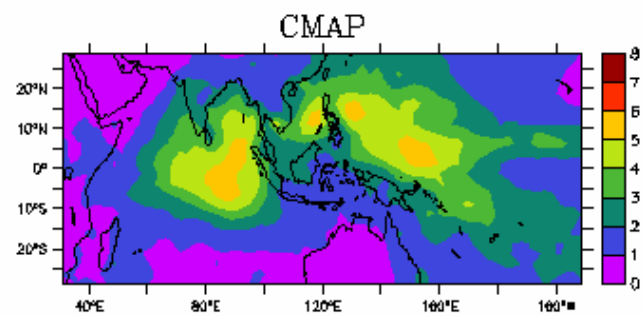
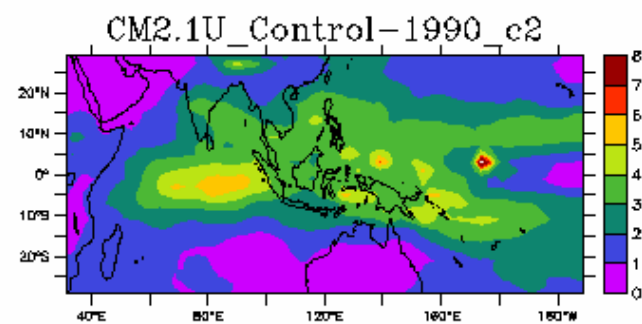
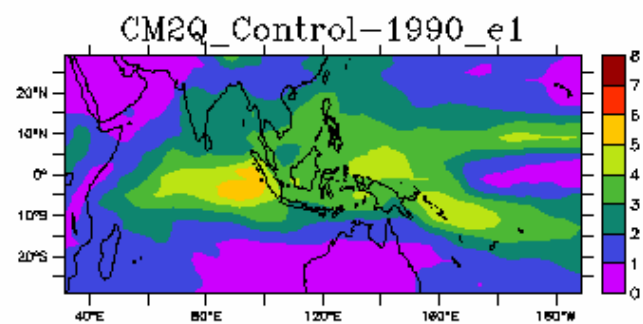
CMAF



am2p12b_amip2

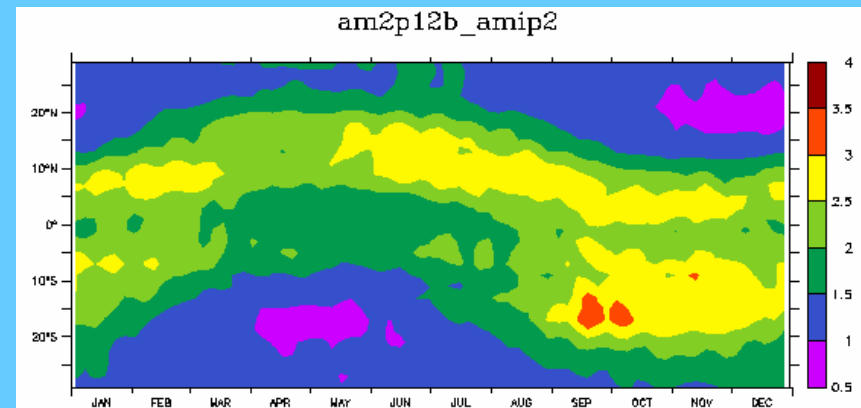
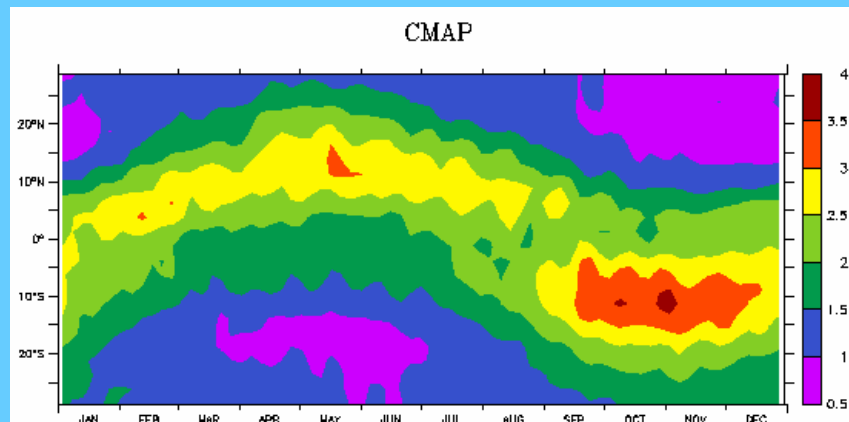
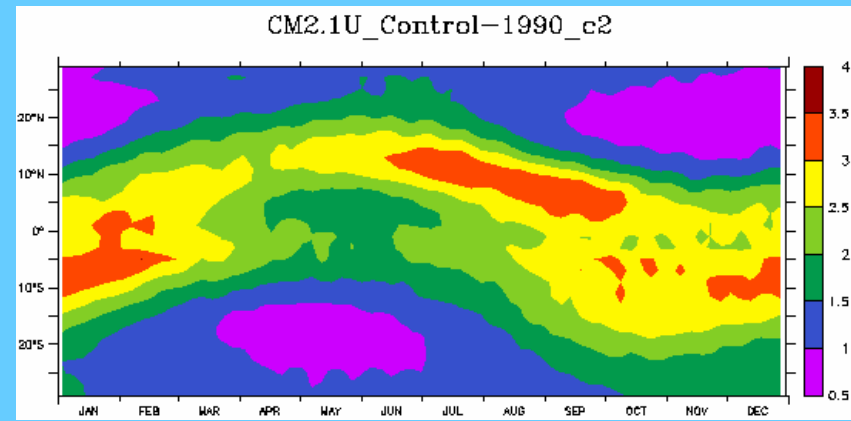
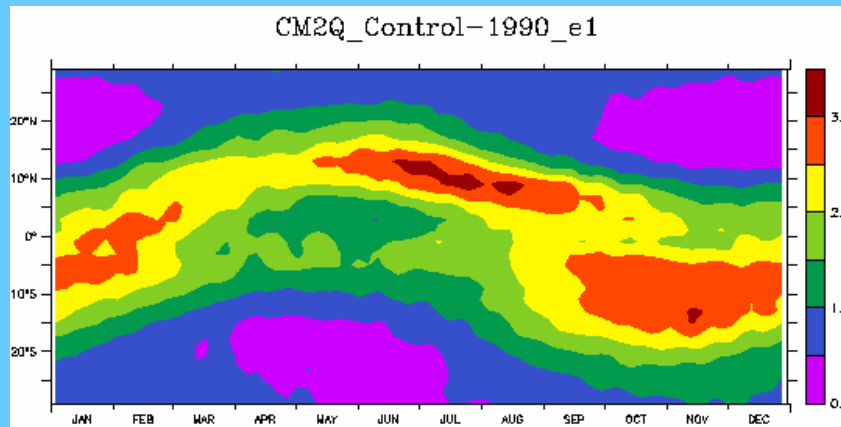


Stdev precip_anom (30-90 day, MAY-OCT)

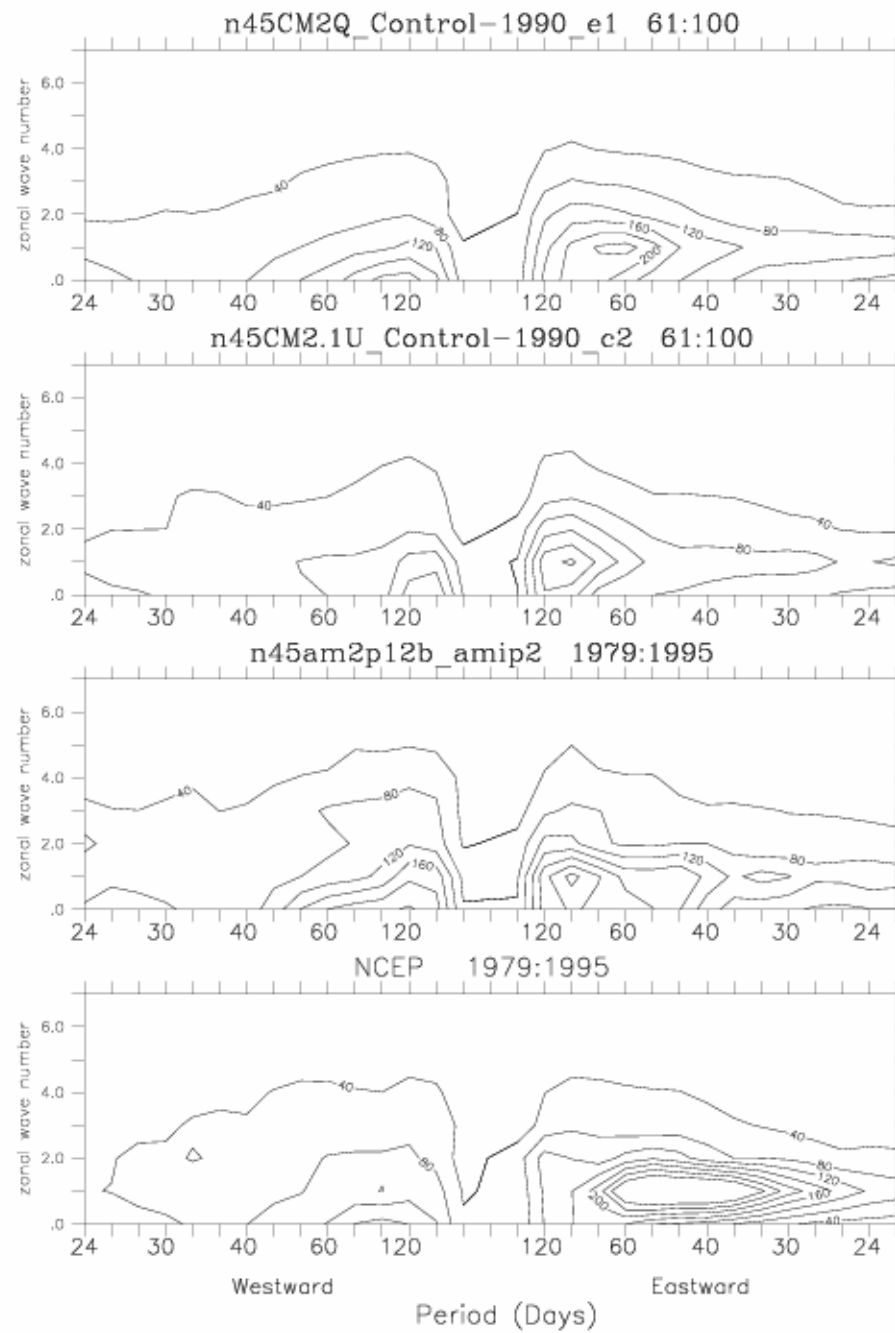


Annual Cycle of Intraseasonal Activity

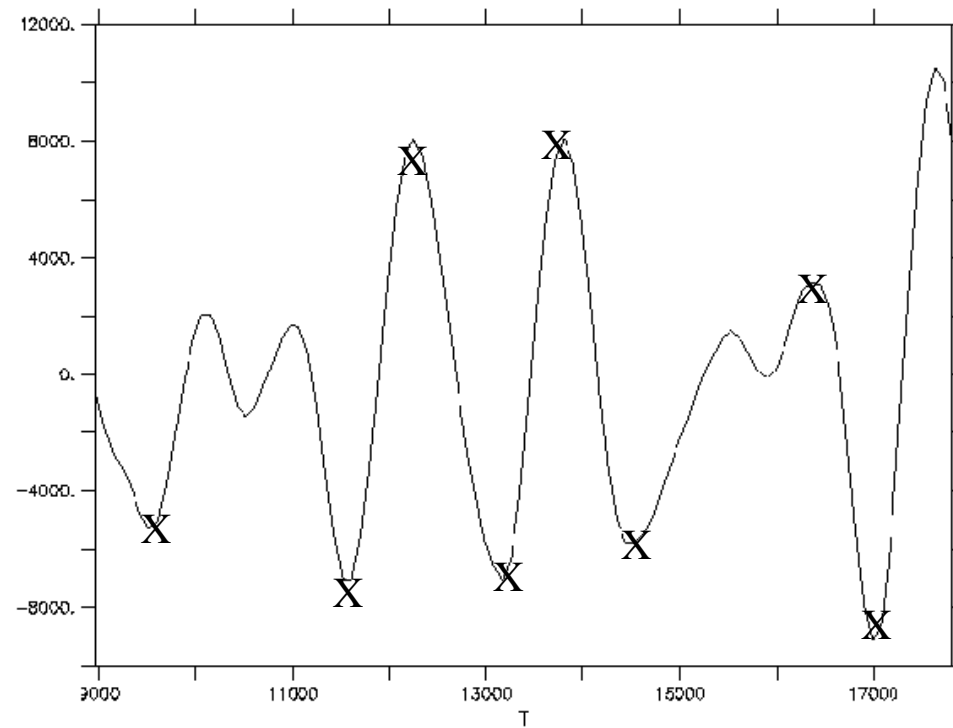
30-90 day filtered precipitation

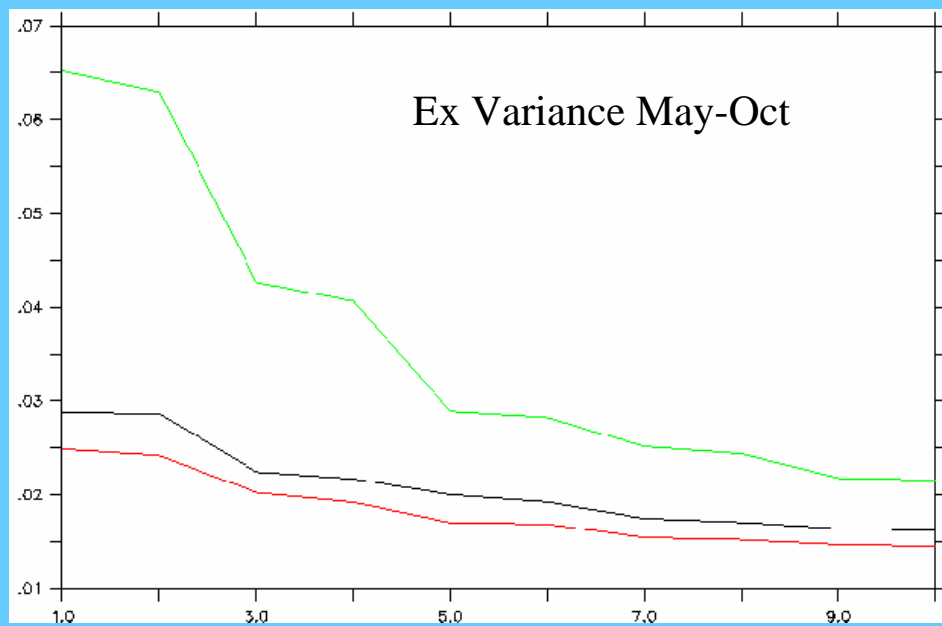
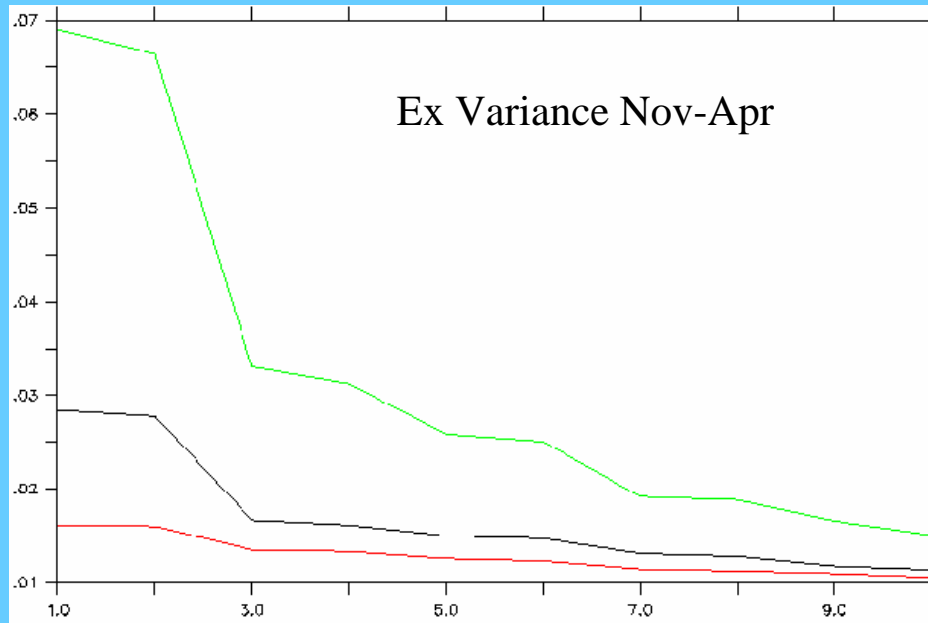


Wave-frequency spectra u_200 Variance ave 5N-5S



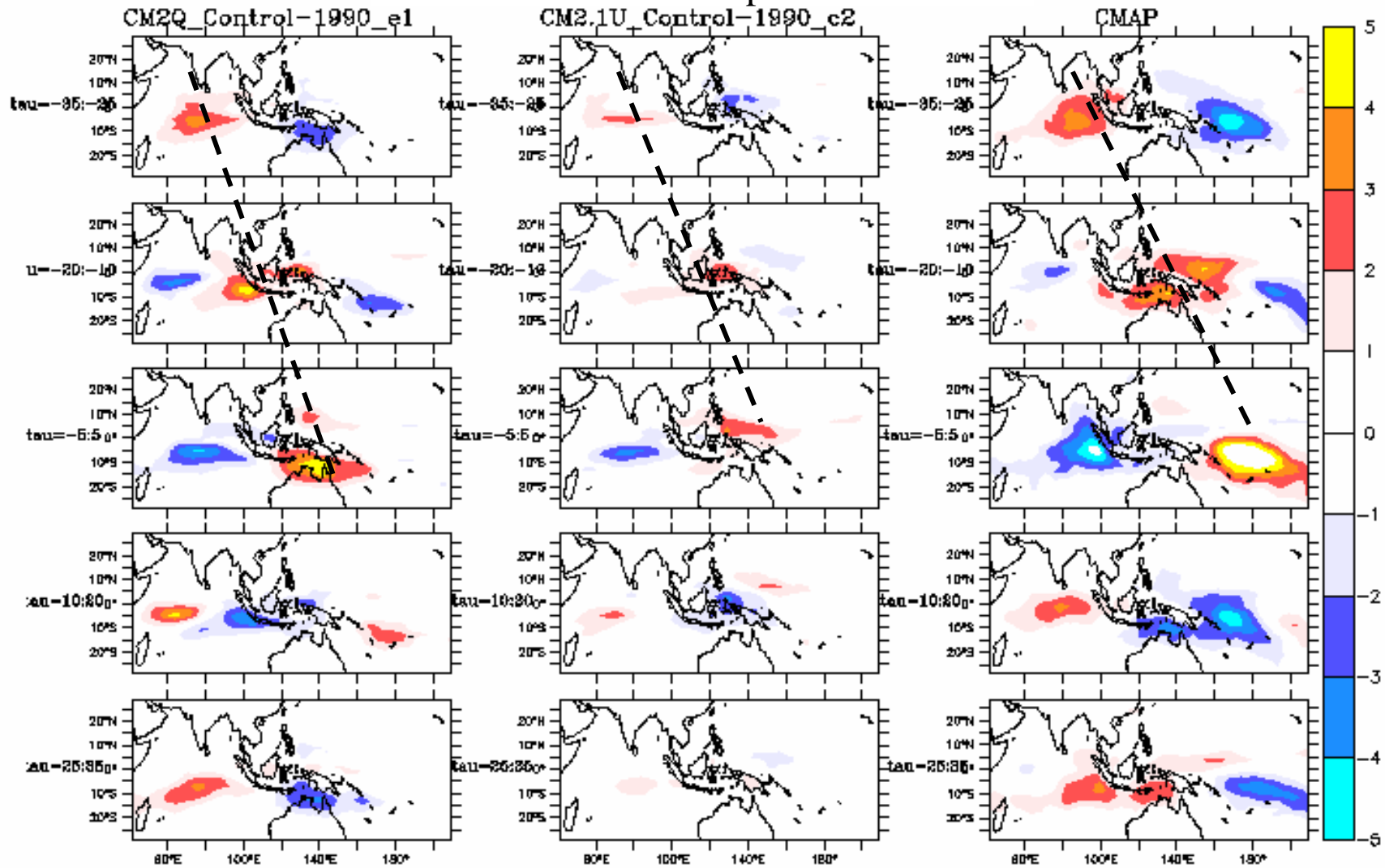
PC Time Series





MJO Composite Life Cycle

Precip



Composite 1+ No. of events = 60

Composite 1+ No. of events = 78

Composite 1+ No. of events = 34

EOF1 explained = 0.027259

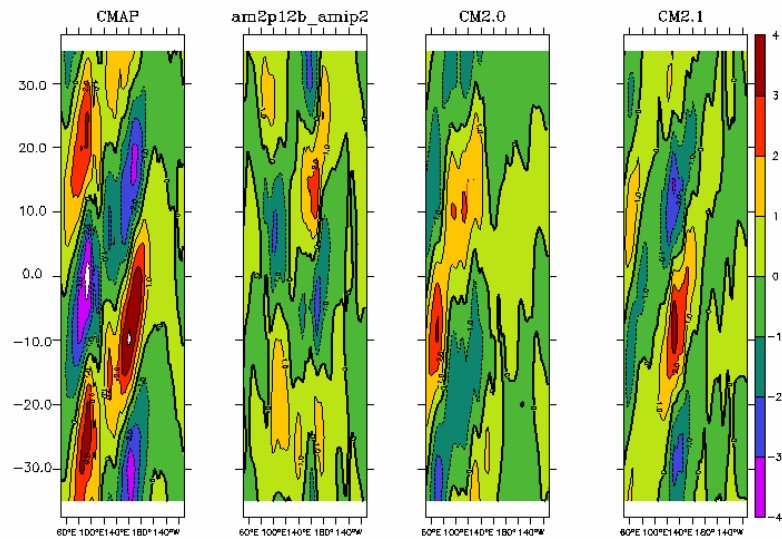
EOF1 explained = 0.016159

EOF1 explained = 0.067094

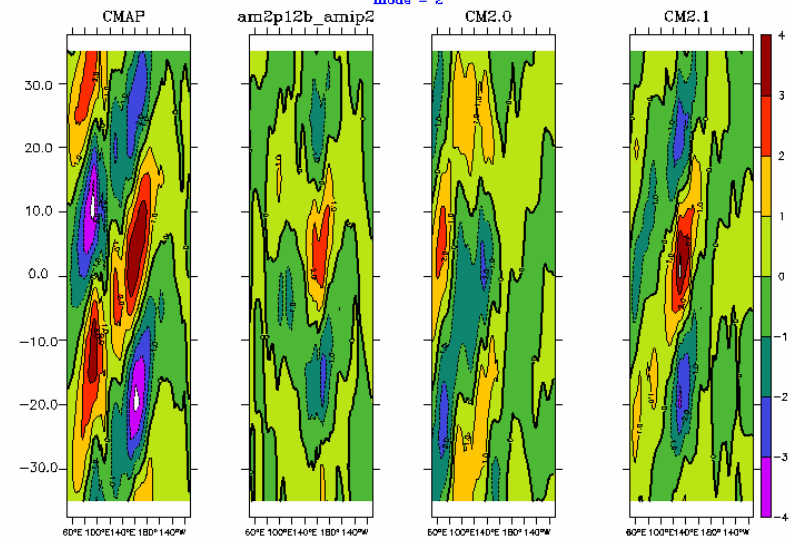
MJO Composite Life Cycle

Longitude - Time

Longitude - Time precip_anom (30 - 90, NOV - APR) ave 5s:5n

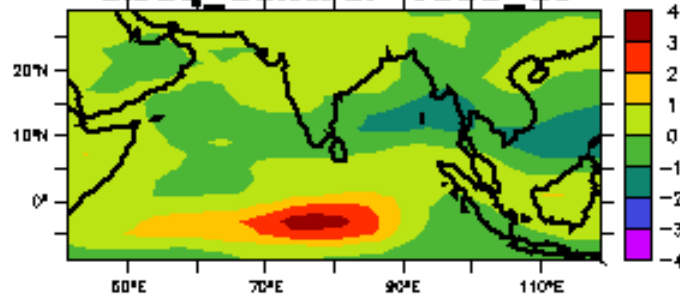


Longitude - Time precip_anom (30 - 90, NOV - APR) ave 5s:5n

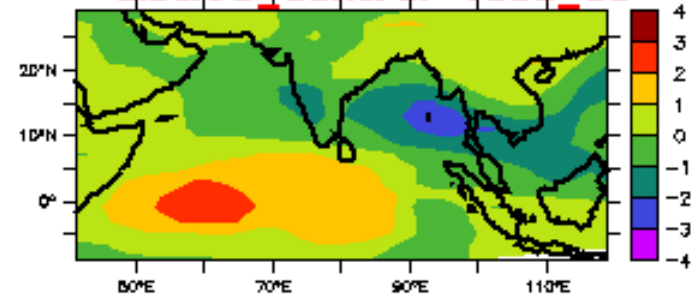


MAYtoOCT

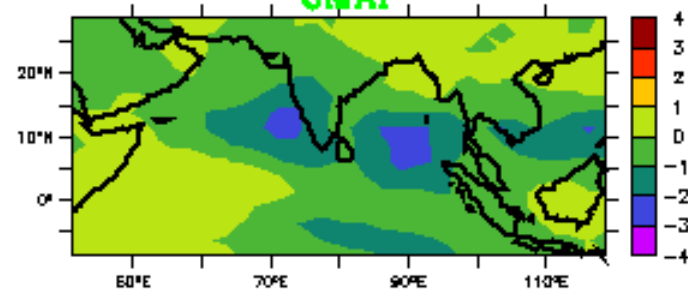
CM2Q_Control-1990_e1



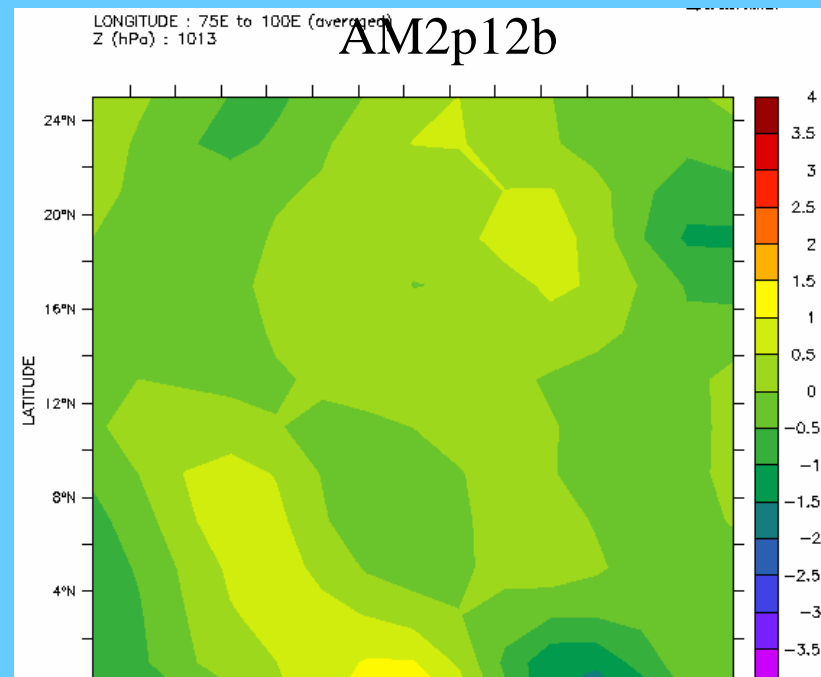
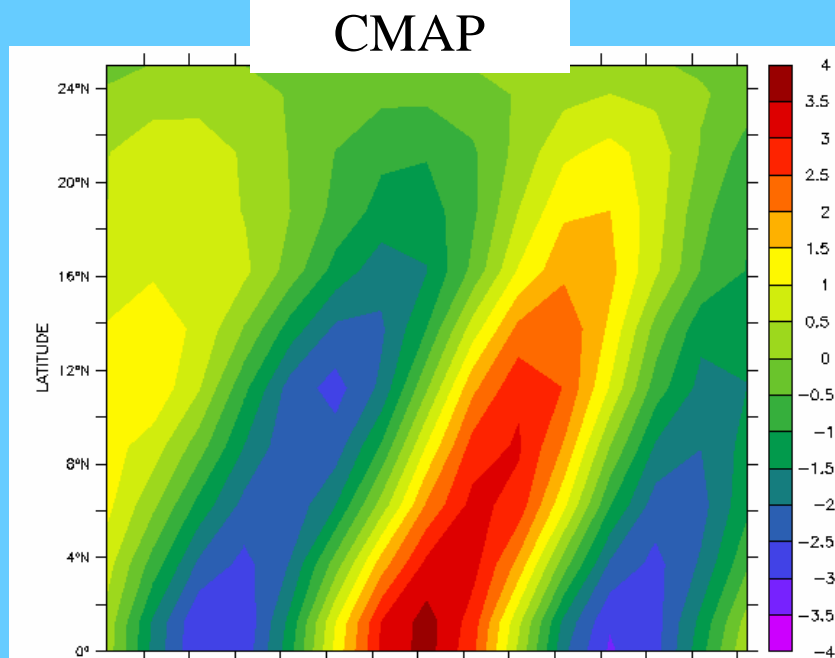
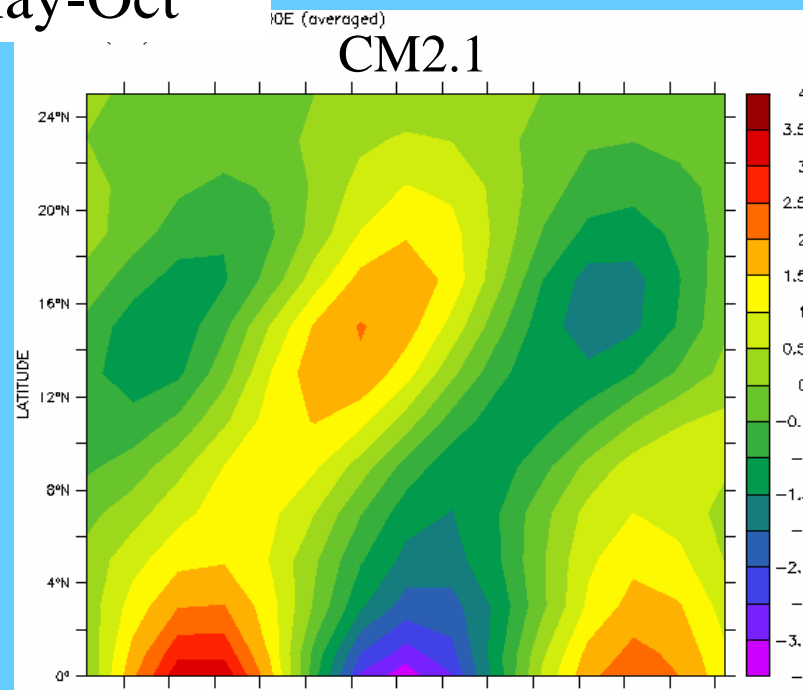
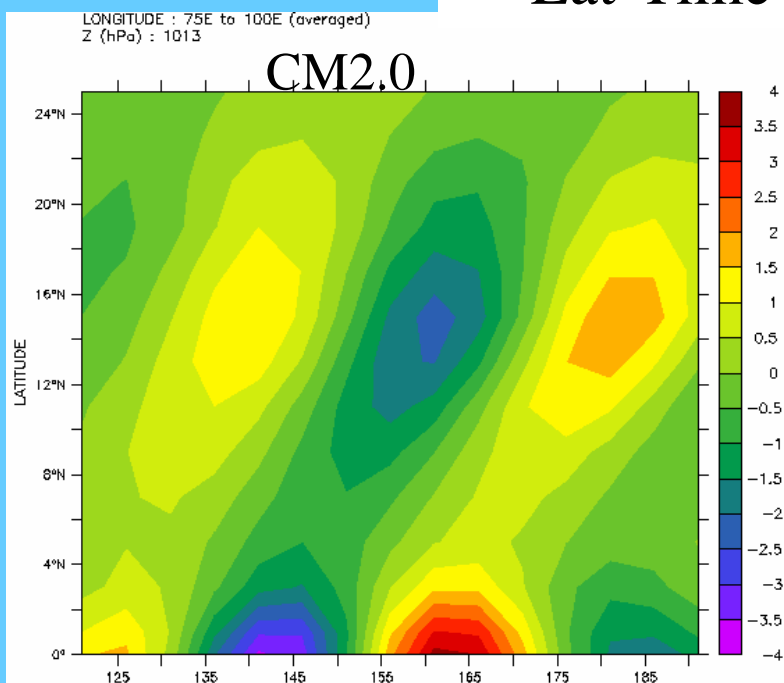
CM2.1U_Control-1990_e2



CMAP



Lat-Time May-Oct



Summary

- **Location / Magnitude/ Seasonality of Intraseasonal Activity:**
CM2 models capture major centers of activity, I.e., Indian Ocean and western Pacific, with too much activity north of the equator in the W. Pacific during Nov-Apr and perhaps not enough on the equator. In May-Oct, the activity in the W. Pacific is somewhat less than observed, especially in the CM2.1 (and AM2), except there is too much of an eastward extension south of the equator (double ITCZ tendency). Neither model captures Bay of Bengal activity, but the CM2 models are significantly improved over the atmospheric models in the Indian Ocean.
- **Wave-Frequency Spectra:**
CM2 show preference for eastward power vs westward but there is a lack of power in the 40-60 day range and too much in the 70-90 day range.
- **MJO/ISO Propagation:**
During Nov-Apr CM2 shows reasonable eastward propagation. CM2.0 appears a bit more coherent than CM2.1. Quadrature relationship between PC1 and PC2 similar to observed.
During May-Oct ISO in both CM2 models propagates eastward and northward from the central Indian Ocean, although there is still a lack of activity in the Bay of Bengal.
- **Future Work:**
Need to look at metrics to assess mechanisms responsible for ISO in the models, i.e., wind induced surface heat exchange and frictional moisture convergence.